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ABSTRACT

This circular lists suggested uses of insecticides for the control of pests by commercial vegetable farmers. Suggestions are given for selection, dosage and application of insecticides to control pests of cabbage and related crops, beans, cucumbers and other vine crops, tomatoes, potatoes, peppers, corn, and onions. (CS)

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ED155029

# 1978 Insect Pest Management Guide

# COMMERCIAL VEGETABLE CROPS And GREENHOUSE VEGETABLES

*You must be certified as a pesticide applicator to use "restricted use" pesticides. See your county extension adviser for information.*

Commercial vegetable gardeners find it impossible to produce vegetables profitably unless they control insects at maximum efficiency and minimum cost. The housewife of today will not accept unsightly wormy vegetables; not only are wormy fruits and vegetables unappetizing but the waste from trimming increases food costs. Thus the commercial vegetable gardener must produce a quality product that is acceptable and safe to the consumer. Careful use of the right insecticides will enable him to do this.

Insect pest management programs, which include the wise selection of cultural, mechanical, biological, and chemical methods, are suggested for the major insect pests of vegetable crops and greenhouses. But, insecticides are still the most efficient means of managing most insects.

This suggested insecticide guide has been prepared for use by Illinois commercial vegetable farmers; it is not for home gardeners, who should use only those insecticides that are extremely safe to handle, apply, and store. Furthermore, the commercial vegetable gardener must use a wider variety of insecticides than the home gardener in order to obtain maximum insect control at the least cost.

In using insecticides, read the label and carefully follow the instructions. Do not exceed maximum rates suggested; observe carefully the interval between application and harvest, and apply only to crops for which use has been approved. Make a record of the product used, the trade name, the percentage content of the insecticide, the dilution, the rate of application per acre, and the dates of application.

Some of the insecticides suggested here can be poisonous to the applicator. In using them, the commercial grower is expected to use precautions to protect himself, his workers, and his family from undue or needless exposure.

In using this guide, always refer to the table on the next page, which lists the limitations and restrictions on use. These limitations apply to the vegetables as human food. If you use any portion of a vegetable for livestock food (tops, stalks, etc.) refer to the label for instructions as to the interval required between application and feeding.

The chemical names used in these tables may be unfamiliar to you. These names are the common coined chemical names and as such are not capitalized. Trade names are capitalized. In the table of limitations the common names are listed first. If the trade name is more commonly used, it is listed in parentheses following the common name. Throughout the tables of suggestions, however, the common name is used if there is one. In case of question, refer to the table of limitations.

These suggestions are subject to change without notification during the growing season.

Requested label clearances for a few uses of insecticides, carriers, and solvents are uncertain for 1978, since many requests have not been officially cleared. Anticipating needed changes in labeling, we began modifying these suggested uses a few years ago. Be sure to check with your county extension adviser if you are in doubt about the insecticide you plan to use. We will make announcements of label changes through the newsletters and news media to keep you up to date.

Insecticides are being classified for *general use* or *restricted use* by the U.S. Environmental Protection Agency. A person wishing to use an insecticide classified for restricted use must be certified as a private or commercial pesticide applicator by the Illinois Department of Agriculture. Contact your county extension adviser in agriculture for details on this program. Only a few insecticides have been classified at this time. More will be classified later. Insecticides bearing a restricted-use classification are identified by an asterisk (*) in this circular.

Suggestions for use of insecticides effective from a practical standpoint are based on available data. Soil textures, pH of the soil, rainfall, slope of the field, wind velocity at planting, method and accuracy of application, and other unpredictable factors affect efficiency.

This publication was prepared by entomologists of the University of Illinois College of Agriculture and the Illinois Natural History Survey.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN COLLEGE OF AGRICULTURE COOPERATIVE EXTENSION SERVICE
In cooperation with ILLINOIS NATURAL HISTORY SURVEY CIRCULAR 897 Urbana, Illinois, December, 1977

SE 024 285

## LIMITATIONS FOR FIELD VEGETABLES IN DAYS BETWEEN APPLICATION AND HARVEST AND OTHER RESTRICTIONS ON USE OF INSECTICIDES IN ILLINOIS

**(Blank spaces indicate the material is not suggested for the specific use in Illinois)**

| Insecticide | Beans | Peas | Broccoli | Brussels sprouts | Cabbage | Cauliflower | Horseradish[1] | Radish[1] | Turnip[1] | Onions | Eggplant | Peppers | Tomatoes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| acephate (Orthene) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 7 | ... |
| *azinphosmethyl (Guthion)[2] | ... | ... | 15 | 7 | 21 | 15 | ... | ... | ... | ... | ... | ... | ... |
| *Bacillus thuringiensis*[3] | ... | ... | 0 | 0 | 0 | 0 | ... | ... | ... | ... | ... | ... | 0 |
| carbaryl (Sevin) | 0 | ... | 3 | 3 | 3 | 3 | 3 | 3 | 3, 14A | ... | 0 | 0 | 0 |
| carbofuran (Furadan) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 21B | ... |
| Dasanit | ... | ... | ... | ... | ... | ... | ... | ... | ... | C, D | ... | ... | ... |
| *demeton (Systox) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | ... |
| diazinon | ... | ... | 5 | ... | 7 | 5 | ... | 10 | 10 | 10 | ... | ... | 1 |
| dicofol (Kelthane) | 7E | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | 2 | 2 |
| dimethoate (Cygon) | 0E | 0E | 7 | ... | 3 | 7 | ... | ... | 14 | ... | ... | 0 | 7 |
| Dyfonate | ... | ... | C | ... | C | C | ... | ... | ... | ... | ... | ... | ... |
| ethion | ... | ... | ... | ... | ... | ... | ... | ... | ... | C | ... | ... | ... |
| malathion | 1 | ... | 3 | 7 | 7 | 7 | 7 | 7 | 3 | 3 | 3 | 3 | 1 |
| *methomyl (Lannate) | 1 | 1, 5A | 3 | 3 | 1 | 3 | ... | ... | ... | ... | ... | 10 | 2 |
| mevinphos (Phosdrin)[2] | ... | ... | 1 | 3 | 1 | 3 | ... | ... | 3 | ... | ... | ... | ... |
| Monitor | ... | ... | 21 | 21 | 35 | 28 | ... | ... | ... | ... | ... | ... | ... |
| naled (Dibrom) | ... | ... | 1 | 1 | 1 | 1 | ... | ... | 4 | ... | ... | ... | ... |
| oxydemetonmethyl (Meta-Systox R) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 7F | 0B | ... |
| *parathion[2] | 7 | ... | 7 | 7 | 10 | 7 | ... | 15 | 10 | ... | 15 | 15 | 10 |
| phorate (Thimet)[2] | C | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| rotenone | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | 1 | 1 |
| trichlorfon (Dylox) | ... | ... | ... | 21 | 21 | 21 | ... | ... | 28E | ... | ... | 21 | 21 |

| Insecticide | Potatoes[1] | Collards | Kale | Lettuce | Spinach | Swiss chard | Sweet corn | Cucumbers[4] | Melons[4] | Pumpkins[4] | Squash[4] Winter | Squash[4] Summer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Bacillus thuringiensis*[3] | ... | 0 | 0 | 0 | 0 | ... | ... | ... | ... | ... | ... | ... |
| carbaryl (Sevin) | 0 | 14 | 14 | 14 | 14 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| diazinon | ... | 10 | 10 | 10 | 10 | 12 | C | 7 | 3 | ... | 3 | 7 |
| dicofol (Kelthane) | ... | ... | ... | ... | ... | ... | ... | 2 | 2 | 2 | 2 | 2 |
| dimethoate (Cygon) | 0 | 14 | 14 | 14 | 14 | 14 | ... | ... | 3 | ... | ... | ... |
| Dyfonate | ... | ... | ... | ... | ... | ... | C | ... | ... | ... | ... | ... |
| malathion | 0 | 7 | 7 | 14 | 7 | 7 | 5 | 1 | 1 | 3 | 1 | 1 |
| *methomyl (Lannate) | 14 | ... | ... | 10 | 7 | ... | 0, 3A | 3 | 3 | ... | ... | ... |
| *mevinphos (Phosdrin)[2] | ... | 3 | 3 | 2 | 4 | ... | ... | ... | ... | ... | ... | ... |
| Mocap | ... | ... | ... | ... | ... | ... | C | ... | ... | ... | ... | ... |
| naled (Dibrom) | ... | 4 | 4 | 1 | 1 | 1 | ... | ... | ... | ... | ... | ... |
| *parathion[2] | 5 | 10 | 10 | 21 | 14 | 21 | 12 | 15 | 7 | 10 | 15 | 15 |
| phorate (Thimet)[2] | C | ... | ... | ... | ... | ... | C | ... | ... | ... | ... | ... |
| rotenone | ... | 1 | 1 | 1 | 1 | 1 | ... | ... | ... | ... | ... | ... |
| trichlorfon (Dylox) | ... | 28G | 21 | 28G | ... | ... | ... | ... | ... | 3F | ... | ... |

* Use restricted to certified applicators only.

[1] Root crops such as radishes, turnips, carrots, horseradish, potatoes, and sugar beets should not be grown in soil where aldrin, dieldrin, or heptachlor was applied as a soil insecticide the preceding year.

[2] Use only by professional applicators or commercial gardeners.

[3] Trade names are Biotrol, Dipel, and Thuricide.

[4] Only apply insecticide late in the day after blossoms have closed to reduce bee kill.

A. If tops or stover is to be used as feed.
B. Not more than twice per season.
C. Soil applications at planting time only.
D. Do not use on green onion crop.
E. Do not use tops for feed or food.
F. Not more than three times per season.
G. Not after edible portions or heads begin to form.

Workers must wear protective clothing if they enter treated fields before time intervals at right. They must also wear protective clothing for all other insecticides applied if spray has not dried or dust has not settled.

**REENTRY INTERVALS FOR WORKER PROTECTION**

| Insecticide | Hours |
|---|---|
| azinphosmethyl (Guthion) | 24 |
| demeton (Systox) | 48 |
| ethion | 24 |
| parathion | 48 |

## CABBAGE AND RELATED COLE CROPS[1]

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Cabbage maggot[2] (NHE-44) | All season | diazinon | 3 | Broadcast | Disk in just before planting. Use only for cabbage, cauliflower, and broccoli. |
| | | Dyfonate | 2 | | |
| | | diazinon granules | 1 | Furrow | At time of planting; on turnips a drenching spray of 1 lb. diazinon should be applied 30 days following treatment. |
| | | *azinphosmethyl | 3 oz. W.P. or 2 oz. E.C. per 50 gal. transplant water | | 6 fluid oz. transplant water per plant. |
| | | diazinon | 4 oz. per 50 gal. transplant water | | |
| Aphid (NHE-47) Thrips (NHE-48) | All season | *azinphosmethyl | ¾ | Foliage | When aphids appear, but before leaves begin to curl. |
| | | dimethoate | 0.3 | | |
| | | malathion | 1 | | |
| | | *mevinphos | ¼ | | |
| | | *parathion | 0.4 | | |
| Diamond-back moth larva; imported cabbage worm; cabbage looper (NHE-45) | All season | *Bacillus thuringiensis*[3] | See rates on label | Foliage | When small worms first appear, and about every 5 to 7 days thereafter. Thorough spray coverage of foliage is important. |
| | | *methomyl | 0.45-0.9 | | |
| | | Monitor | 1 | | |
| Cutworm | At planting | trichlorfon | 1 | Soil | At planting, at base of plant or as needed when damage first occurs. |
| Flea beetle and leafhopper | All season | carbaryl | 1½ | Foliage | As needed. |

* Use restricted to certified applicators only.
[1] Root crops such as radishes, turnips, carrots, potatoes, and sugar beets should not be grown in soil where aldrin, dieldrin, or heptachlor was applied as a soil insecticide the preceding year.
[2] Maggots are resistant to diazinon in some areas of Illinois.
[3] No time limitations.
E.C. = emulsion concentrate; W.P. = wettable powder.

## COLLARDS, KALE, LETTUCE, SPINACH, SWISS CHARD

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Aphid (NHE-47) | All season | diazinon | ½ | Foliage | As needed. |
| | | dimethoate | 0.3 | | |
| | | *mevinphos | ¼ | | |
| | | naled | 1 | | |
| | | *parathion | 0.4 | | |
| Cutworm | On seedling plants | trichlorfon | 1 | Base of plant and soil | When first damage appears. |
| Leafhopper | All season | carbaryl | 1½ | Foliage | When first leafhoppers appear and as needed. |
| | | dimethoate | 0.3 | | |
| | | malathion | 1 | | |
| Caterpillar (NHE-45) | All season | *Bacillus thuringiensis*[1] | See rates on label | Foliage | When small worms first appear and every 5 to 7 days thereafter. |
| | | naled | 1 | | |
| Leaf miner | All season | diazinon | ½ | Foliage | When first miners are observed. |
| | | dimethoate | 0.3 | | |
| | | *parathion | 0.4 | | |
| Flea beetle | All season | carbaryl | 1 | Foliage | As needed. |
| | | rotenone | ¼ | | |

* Use restricted to certified applicators only.
[1] No time limitations.

## BEANS

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Seed maggot (NHE-27) | All season | diazinon 50% W.P.[1] | 3/5 oz./bu. | Seed | Treat seed no longer than 3 months before planting. |
| | | Lorsban 25% W.P.[1] | 2 oz./bu. | Seed | |
| | | phorate granules | 1½ | Soilband | Place on either or both sides of row at planting but not in contact with seed. |
| Bean leaf beetle (NHE-67) | Early and late season | carbaryl | 1 | Foliage | When feeding first appears and weekly for 2 or 3 applications as needed. |
| | | malathion | 1 | | |
| Leafhopper (NHE-22) and plant bug (NHE-68) | All season | carbaryl | 1 | Foliage | Before plants become yellow and stunted. Repeat applications at weekly intervals as necessary. |
| | | dimethoate | 0.3 | | |
| | | malathion | 1 | | |
| | | *methomyl | 0.45 | | |
| | | phorate granules | 1½ | Soilband | As for seed maggot. |
| Mexican bean beetle | Midseason and late season | carbaryl | ½ | Foliage | When occasional leaves show lacework feeding. |
| | | malathion | 1 | | |
| | | phorate granules | 1½ | Soilband | As for seed maggot. |
| Aphid (NHE-47) | All season | dimethoate | 0.3 | Foliage | Usually applied when a few aphids can be found on each plant, but before leaves begin to curl and deform. |
| | | malathion | 1 | | |
| | | phorate granules | 1½ | Soilband | As for seed maggot. |
| Blister beetle (NHE-72) | Midseason and late season | carbaryl | 1½ | Foliage | As needed. |
| Corn earworm (NHE-33) Corn borer | Late season | carbaryl | 1½ | Foliage | As needed, but usually after September 1. Worms may be present before bloom. |
| | | *methomyl | 0.45 | | |
| | | *parathion | ½ | | |
| Mites | Midseason and late season | dicofol | 0.4 | Foliage | As needed, but especially during drouthy periods particularly if carbaryl has been used on crops. |
| | | dimethoate | 0.3 | | |
| | | malathion | 1 | | |
| | | phorate granules | 1½ | Soilband | As for seed maggot. |

* Use restricted to certified applicators only.
[1] No restrictions when used as recommended.

## CUCUMBERS AND OTHER VINE CROPS[1]

| Insect | Time of attack | Insecticide[2] | Lb. of active ingredient per acre | Placement | Timing of application[3] |
|---|---|---|---|---|---|
| Striped and spotted cucumber beetles (NHE-46) | Seedling to mature plants | carbaryl | 1 | Foliage | When beetles first appear; as often as necessary thereafter. |
| | | *parathion | ½ | | |
| Aphid (NHE-47) | All season | diazinon | ½ | Foliage | When aphids become noticeable. |
| | | dimethoate[3] | 0.3 | | |
| | | malathion | 1 | | |
| | | *parathion | ½ | | |
| Squash bug (NHE-51) | All season | *parathion | ½ | Foliage | Do not apply until first eggs are found hatching (about June 15 to July 15). |
| | | trichlorfon[4] | 1 | | |
| Leafhopper | July-August | malathion | 1 | Foliage | As needed. |
| | | dimethoate[3] | 0.3 | | |
| Squash vine borer | June-September | carbaryl | 1 | Base of stem for 3 ft. | Weekly applications when vines begin to run—usually 5 applications. |
| Pickle worm | August-September | carbaryl | 1 | Foliage | Weekly applications, beginning in late August. |
| Mites | July-September | dicofol | ½ | Foliage | As needed. |
| | | malathion | 1 | | |
| | | *parathion | ½ | | |
| Cutworm (NHE-77) | April-June | carbaryl | 2 | Base of plants | As needed. |

* Use restricted to certified applicators only.
[1] Pumpkins should not be grown on soil that has been treated with aldrin, dieldrin, or heptachlor the preceding year.
[2] Spray vine crops with insecticide only late in the day after blossoms have closed to reduce bee kill.
[3] Do not use dimethoate on cucumbers.
[4] Pumpkin is the only vine crop for which trichlorfon should be used for squash bug control. Apply only once per season.

## TOMATOES AND EGGPLANT

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Cutworm (NHE-77) | Early and midseason | carbaryl<br>trichlorfon | 2<br>1 | Base of plants or foliage | As needed. |
| Flea beetle | May-June | carbaryl<br>rotenone | 2<br>0.2-0.4 | Foliage | Apply every week as long as needed. |
| Aphid (NHE-47) | May-July | diazinon<br>dimethoate[1]<br>malathion<br>*parathion | ¼<br>0.3<br>1<br>0.4 | Foliage | As needed, but before leaves curl. |
| Cabbage looper | July-September | *Bacillus thuringiensis*<br>*methomyl | See rates on label<br>0.45-0.9 | Foliage | When loopers are present. |
| Corn earworm<br>Corn borer | July-September; occasionally in June | carbaryl<br>*methomyl[1] | 2<br>0.45-0.9 | Foliage | Add to weekly applications of fungicide sprays beginning at first fruit set. If spraying is infrequent, use 6 lb. of toxaphene. |
| Hornworm | July-September | carbaryl<br>trichlorfon | 2<br>1 | Foliage | When first small worms appear. |
| Mites | July-September | carbophenothion<br>dicofol<br>malathion<br>*parathion | 1<br>½<br>1<br>0.4 | Foliage | As needed. |
| Russet mite | July-September | *parathion<br>sulfur dust[2]<br>sulfur spray[2] | 0.4<br>10<br>10 | Foliage | As needed. |
| Blister beetle (NHE-72) | June-September | carbaryl<br>*parathion | 1½<br>¼ | Foliage | As needed. |
| Fruit fly and picnic beetle | August-October | diazinon spray<br>diazinon granules | ½<br>1 | Foliage | When flies or beetles first appear. |
| | | pyrethrin dust[2] | 1 | Foliage | Apply to hamper immediately after it is filled. |

* Use restricted to certified applicators only.
[1] Use cleared only on tomatoes. [2] No limitations on use.

## PEPPERS

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Aphid (NHE-47) | May-July | dimethoate<br>demeton<br>*methomyl<br>oxydemetonmethyl<br>acephate | 0.3<br>⅜<br>0.45<br>½<br>½ | Foliage | Only when aphids are present. Add to borer spray when it is being used. |
| Corn borer | Late season | carbaryl<br>acephate | 2<br>1 | Foliage and fruit | When fruit is present on plant. Apply every 5 days when borers are present. |
| | | carbofuran | 2-3 | Soilband to transplant | Make 2 applications; first, 3 weeks after transplant, second, 5 weeks later. |

* Use restricted to certified applicators only.

## ASPARAGUS

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Asparagus beetle (NHE-49) | Early and midseason on spears and ferns | carbaryl[1]<br>malathion[1]<br>rotenone[1] | 1½<br>1<br>0.2-0.4 | Spears and ferns<br>Spears | As needed, not more often than every 3 days.<br>As needed. |

[1] One-day restriction between last application and harvest.

## SWEET CORN

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Soil insects (NHE-26, 27, 43) | April-August | diazinon<br>Dyfonate<br>Mocap<br>phorate | 1<br>1<br>1<br>1 | Row | Apply on soil surface behind planter shoe and ahead of press wheel. |
| Cutworm (NHE-38) | April-June | carbaryl[1]<br>carbaryl bait | 2-3<br>1 | Base of plants | When first damage appears. |
| Flea beetle (NHE-36) | April-July | carbaryl[1] | 1½ | Foliage | As necessary. |
| Japanese beetle (NHE-32) | July-September | carbaryl[1] | 1 | Ear zone | As necessary. |
| Corn borer | June-September | carbaryl[1]<br>*methomyl | 2<br>0.45 | Foliage | Make first application when tassel ratio is 30 to 40. Repeat every 4 to 5 days as long as field has 20 or more unhatched egg masses per 100 plants. |
| Corn earworm[2] (NHE-33) | June-September | carbaryl[1]<br>*methomyl | 2<br>0.45 | Ear zone | Market corn: At first silk and every 2 to 3 days for 5 to 8 applications. On very early or late planted corn, treatment may be necessary before silking when eggs are being laid on stalks and flag leaves.<br>Canning corn: At 30 to 50% silk and every 3 days thereafter until corn is within 8 to 12 days of harvest. |
| Sap beetle (NHE-10)<br>Picnic beetle | July-September | carbaryl[1]<br>diazinon<br>malathion<br>*parathion | 2<br>1<br>1<br>½ | Foliage | When adults first appear in field; usually between pollen-shedding and silk-drying. |
| Corn leaf aphid (NHE-29) | July-September | malathion<br>*parathion | 1<br>½ | Foliage | As needed to produce attractive ears for fresh market. |
| Fall armyworm | July-September | *methomyl<br>*parathion | 0.45<br>½ | Foliage | Apply to ear zone when whorl feeding is evident. |

* Use restricted to certified applicators only.
[1] During pollen shed, apply carbaryl as late in the day as possible (preferably after 4 p.m.) to reduce bee kill.
[2] Addition of 0.5 to 0.75 pound of parathion or 0.25 to 0.45 pound of methomyl to carbaryl improves earworm control.

## ONIONS

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Onion maggot (NHE-50) | All season | diazinon W.P.<br>ethion W.P. | ½-1 for 40-50 lb. of seed<br>1 for 40-50 lb. of seed | Seed | Seed treatment for set onions only. Use lighter dosage of diazinon on sandy, highly mineral soils. |
| | | Dasanit granules<br>diazinon granules<br>Dyfonate<br>ethion granules | 1<br>½-1<br>1<br>½-2 | Furrow | Use 1 lb. active ingredient per acre for rows 12" apart; ¾ lb. for rows 18" apart; ½ lb. for rows 24" apart. Up to twice these amounts are needed for ethion on muck soils. Do not use Dasanit or Dyfonate on green onions. |
| | | diazinon | 2 | Broadcast | Preplanting; disk into upper 1 to 2 inches of soil. Supplement with foliage spray below. |
| | | diazinon<br>malathion | ⅓<br>1 | Foliage | Supplemental to soil treatment. Make first application when first adult flies are seen; make another 1 week later. From then on only as necessary. |
| Thrips (NHE-48) | Midseason and late season | diazinon<br>malathion | ½<br>1 | Foliage | When injury first appears and every 10 days as necessary. |

## POTATOES[1]

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Flea beetle | May-July | carbaryl | 1 | Foliage | When first damage appears on leaves, and repeat as needed. |
| | | *methomyl | 0.45 | | |
| Colorado potato beetle | May-July | carbaryl | 1 | Foliage | As needed. |
| Potato leafhopper (NHE-22) | May-July | carbaryl | 1 | Foliage | Weekly applications when leafhoppers first appear. |
| | | dimethoate | 0.3 | | |
| | | *methomyl | 0.45 | | |
| | | phorate granules | 2-3 | Soilband | Place on either or both sides of row at planting but not in contact with seed. Use lower rate on sandy soils and heavier rate on heavy soils. Do not use on muck soils. |
| Aphid (NHE-47) | All season | dimethoate | 0.3 | Foliage | As needed. |
| | | malathion | 1 | | |
| | | *methomyl | 0.45 | | |
| | | *parathion | ¼ | | |
| | | phorate granules | 2-3 | Soilband | As for leafhoppers. |
| Blister beetle (NHE-72) | All season | carbaryl | 1½ | Foliage | As needed. |
| Wireworm (NHE-43) White grub (NHE-23) | All season | phorate granules | 2-3 | Soil | Preplanting, disk in; or use as soilband at planting. |
| Grasshopper (NHE-74) | July-September | carbaryl | ¾ | Foliage | As needed, control in fence rows, roadsides, ditch banks, etc., before migration. |

* Use restricted to certified applicators only.
[1] Potatoes should not be grown in soil where aldrin, dieldrin, or heptachlor was applied as a soil insecticide the preceding year.

## PEAS

| Insect | Time of attack | Insecticide | Lb. of active ingredient per acre | Placement | Timing of application |
|---|---|---|---|---|---|
| Caterpillars including loopers | June | *methomyl | ½-1 | Foliage | Before harvest if worms are present. |
| Aphids | May-June | dimethoate | ⅓ | Foliage | As needed. |

* Use restricted to certified applicators only.

### Limitations for Greenhouse Tomatoes

| Insecticide | Tomatoes |
|---|---|
| endosulfan (Thiodan) | 15 hours |
| malathion | 15 hours |
| metaldehyde | As bait applied only to soil |
| naled (Dibrom) | 1 day |
| *parathion[1] | 10 days |

* Use restricted to certified applicators only.
[1] Do not use aerosols that contain parathion, tepp, or the propellant methyl chloride in greenhouses connected to living quarters.

## GREENHOUSE TOMATOES

| Insect | Insecticide[1] | Dosage and formulation | Application |
|---|---|---|---|
| Aphid<br>Whitefly | malathion aerosol | 1 lb. 10% aerosol per 50,000 cu. ft. | In a closed greenhouse above plants. |
| | naled vapor | 5 oz. of 4% E.C. per 50,000 cu. ft. | Apply on steampipes. |
| | *parathion aerosol | 1 lb. 10% aerosol per 50,000 cu. ft. | In a closed greenhouse above plants. |
| Mealybug<br>Spider mite<br>Russet mite<br>Thrip | | Use malathion or parathion aerosol as suggested for aphid and whitefly. | |
| Armyworm<br>Cabbage looper<br>Cutworm<br>Tomato fruitworm | malathion aerosol | 1 lb. 10% aerosol per 50,000 cu. ft. | In a closed greenhouse above plants. |
| | *parathion aerosol | 1 lb. 10% aerosol per 50,000 cu. ft. | In a closed greenhouse above plants. |
| Slug | metaldehyde | Commercially prepared bait or spray | To mulch on soil surface. Do not contaminate edible parts. |

* Use restricted to certified applicators only.
[1] See page 7 for limitations between application and harvest.

## FOP ADDITONAL INFORMATION

Obtain the following circulars on insect control from the Office of Agricultural Publications, 123 Mumford Hall, Urbana, Illinois 61801.

Circular 899, Insect Pest Management Guide — Field and Forage Crops

Circular 900, Insect Pest Management Guide — Home, Yard, and Garden

Circular 1076, Turfgrass Pest Control

Leaflets describing the life history, biology, and habits of some of the insects mentioned can be obtained from the offices of county extension advisers or by writing to Entomology Extension, 169 Natural Resources Building, Urbana, Illinois 61801. These are indicated by an NHE number in the tables.

## FOR YOUR PROTECTION

Always handle insecticides with respect. The persons most likely to suffer ill effects from insecticides are the applicator and his family. Accidents and careless, needless overexposure can be avoided. Here are a few easy rules that if followed will prevent most insecticide accidents:

1. Wear rubber gloves when handling insecticide concentrates.
2. Do not smoke while handling or using insecticides.
3. Keep your face turned to one side when opening insecticide containers.
4. Leave unused insecticides in their original containers with the labels on them.
5. Store insecticides out of reach of children, irresponsible persons, or animals; store preferably in a locked cabinet.
6. Triple-rinse and bury or burn all empty insecticide containers or take to an approved sanitary landfill.
7. Do not put the water-supply hose directly into the spray tank.
8. Do not blow out clogged nozzles or spray lines with your mouth.
9. Wash with soap and water exposed parts of body and clothes contaminated with insecticide.
10. Do not leave puddles of spray on impervious surfaces.
11. Do not apply to fish-bearing or other water supplies.
12. Do not apply insecticides, except in an emergency, to areas with abundant wildlife or to blossoming crops visited by bees. Avoid drift onto blossoming crops or onto bee hives.
13. Do not apply insecticides near dug wells or cisterns.
14. Do not spray when weather conditions favor drift.
15. Observe all precautions listed on the label.
16. To avoid bee kill, apply insecticides after bee activity has been completed for the day; use the least toxic materials. *Warn beekeepers that you are applying insecticides.*

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